

4.3.4.2.4 Water Resources

The construction and operation of a ceramic immobilization facility would affect water resources. Water resource requirements and discharges provided in Tables C.1.1.3–5 and C.2.1.3–5 and Table E.3.3.5–1, were used to assess impacts to surface water and groundwater. The discussion of impacts is provided for each site separately. Table 4.3.4.2.4–1 presents No Action surface water and groundwater uses and discharges at each site, and the potential changes resulting from construction and operation of the ceramic immobilization facility to a HLW repository.

Hanford Site

Surface Water. Surface water from the Columbia River would be used as the water source for construction and operation of the ceramic immobilization facility. During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr), which would represent a 0.3-percent increase over the projected annual surface water withdrawal (13,511 million l/yr [3,569 million gal/yr]). During operation, the total annual water requirement for the ceramic immobilization facility would be approximately 250 million l/yr (66 million gal/yr). This would represent a 1.9-percent increase over the projected surface water annual withdrawal and would increase Hanford's total withdrawals to 0.04-percent of the minimum average flow of the Columbia River. These additional withdrawals would have a negligible impact on surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary wastewater (28.8 million l/yr [7.6 million gal/yr]) would be generated, treated, and discharged to evaporation/percolation ponds. This amount would represent a 11.7-percent increase in the annual amount being discharged. During operation, approximately 98 million l/yr (25.9 million gal/yr) of sanitary and other wastewater would be recycled or discharged to evaporation/percolation ponds. This amount would represent a 39.8-percent increase in the amount being discharged. All discharges would be monitored to comply with discharge requirements.

All chemical and industrial liquid nonradioactive waste streams (for example, system condensate, fire sprinkler water, cooling system blowdown, etc.) would be monitored, collected, and treated if necessary prior to recycle within the facility or discharge to the environment. These wastes would be sampled continuously for radioactivity and effluents would be automatically diverted to the effluent retention tank if contamination were detected.

The ceramic immobilization facility would be located in the 200 Area which is above the 100-year, 500-year, and probable maximum flood boundaries; flooding from dam failures; and flooding from a landslide resulting in river blockage.

Groundwater. No groundwater would be used for construction or operation of the facility; therefore there would be no impact to groundwater availability. Construction and operation of the facility would not result in direct discharges to groundwater. Treated wastewater discharged to disposal ponds which does not evaporate, however, could percolate downward into the near surface aquifer groundwater. This water would be monitored and would not be discharged to the ponds until contaminant levels are within the limits specified. Impacts to groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of the potential impacts to groundwater quality are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Table 4.3.4.2.4-1. Potential Changes to Water Resources Resulting From the Ceramic Immobilization Alternative

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Water Source						
No Action water requirements (million l/yr)	13,511	2,400	7,570	249	14,760	13,247
No Action wastewater discharge (million l/yr)	246	82	540	141	2,277	700
Construction						
Water Availability and Use						
Total water requirement (million l/yr)	38	38	38	38	38	38
Percent increase in projected water use ^a	0.3	1.6	0.5	15.3	0.3	0.3
Water Quality						
Total wastewater discharge (million l/yr)	28.8	28.8	28.8	28.8	28.8	28.8
Percent change in wastewater discharge ^b	11.7	35.1	5.3	20.4	1.3	4.1
Percent change in streamflow	neg	NA	NA	NA	0.06 ^c	0.6 ^d
Operation						
Water Availability and Use						
Total water requirement (million l/yr)	250	250	250	250	250	250
Percent increase in projected water use ^e	1.9	10.4	3.3	100	1.7	1.9
Water Quality						
Total wastewater discharge (million l/yr)	98	98	98	98	98	98
Percent change in wastewater discharge ^f	39.8	119.5	18.1	69.5	4.3	14.0
Percent change in streamflow	neg	NA	NA	NA	0.2 ^c	1.9 ^d
Floodplain						
Is action in 100-year floodplain?	No	No	No	No	No	No
Is critical action in 500-year floodplain?	No	Uncertain	Uncertain	No	Uncertain	Unlikely

^a Percent increases in water requirements during construction of the ceramic immobilization facility are calculated by dividing water requirements for the facility (38 million l/yr with that for each site No Action water requirements: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

^b Percent changes in wastewater discharged during construction for the new ceramic immobilization facility are calculated by dividing wastewater discharges for the facility (28.8 million l/yr) with the No Action wastewater discharge for each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

^c Percent changes in stream flow from wastewater discharges are calculated from the average flow of Clinch River (132 m³/s) and East Fork Poplar Creek (1.5 m³/s). The comparison for the East Fork Poplar Creek is shown in the table.

^d Percent changes in stream flow from wastewater discharges are calculated from the minimum flow of the Fourmile Branch (0.16 m³/s).

^e Percent increases in water requirements during operation of the ceramic immobilization facility are calculated by dividing water requirements (250 million l/yr with that for each site No Action water requirements: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

^f Percent changes in wastewater discharged during operation of the ceramic immobilization facility are calculated by dividing wastewater discharge rate for the new facility (98 million l/yr) with the No Action wastewater discharge for each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

Note: NA=not applicable; neg=negligible. Construction impacts are considered to be temporary, lasting only through the construction period. Impacts from operations would occur continuously.

Source: HF 1995a:1; INEL 1995a:1; LLNL 1996d; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; SRS 1995a:2.

Nevada Test Site

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with facility; groundwater would be used as the water source for construction and operation of the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary wastewater, and other nonhazardous wastewater (28.8 million l/yr [7.6 million gal/yr]), would be generated. During operation, a maximum of approximately 98 million l/yr (25.9 million gal/yr) of sanitary and other wastewater would be discharged to a new wastewater treatment system. After treatment, all wastewater generated during construction and operation would be available for recycle.

Water from heating the facility will be recycled to the heating unit. Steam plant blowdown would be discharged through the sanitary wastewater system. Condensation from heating, air conditioning and other distillates, fire sprinkler water and truck hose-down water would be monitored for radioactivity, and if uncontaminated, available for recycle or discharge to natural drainage channels.

No studies to assess the 500-year floodplain boundaries at NTS have been conducted. Studies of the 100-year floodplain have shown it to be confined to the Jackass Flats and Frenchman Lake areas. The proposed site for the ceramic immobilization facility is not located in either of these areas. However, since the NTS is in a region where most flooding occurs by locally intense thunderstorms which can create brief (less than 6 hours) flash floods, the facilities would be designed to withstand such flooding. Information on the location of the 500-year floodplain could be developed in future environmental studies.

Groundwater. All water required for construction and operation would be supplied from groundwater. Quantities required and the percent increase in projected water use are shown in Table 4.3.4.2.4-1. Construction water requirements for the facilities (38 million l/yr [10 million gal/yr]) would represent approximately 0.1 percent of the minimum estimated annual recharge (38 billion l/yr [10 billion gal/yr]) to the regional aquifer under the entire NTS. As shown in Table 4.3.4.2.4-1, the quantity of water required for construction of the proposed facility would represent a 1.6-percent increase over the projected No Action groundwater use. Operating the facility at NTS would require 250 million l/yr (66 million gal/yr), which is approximately 10.4 percent of the projected groundwater use. This additional withdrawal would represent 0.7 percent of the estimated minimum annual recharge, and would increase the total amount withdrawn annually at NTS to 7.0 percent of the estimated annual recharge. These additional withdrawals would not impact groundwater availability.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater discharged to disposal ponds, however, could percolate downward toward the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged to the ponds until contaminant levels are within the limits specified. Impacts to groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combine effects of a deep water table, low discharge volumes, and high evaporation rates.

Idaho National Engineering Laboratory

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary wastewater (28.8 million l/yr [7.6 million gal/yr]) would be generated, treated, and discharged to evaporation/percolation ponds, or be available for recycle. During operation, approximately 98 million l/yr (25.9 million gal/yr) of sanitary and other nonhazardous liquids (including industrial wastewater, cooling water, blowdown, and stormwater runoff) would be treated and discharged to evaporation/percolation ponds, or be available for recycle. All discharges would be monitored to comply with discharge limits.

All chemical and industrial liquid nonradioactive waste streams (for example, system condensate, fire sprinkler water, cooling system blowdown) would be monitored, collected, and treated, if necessary, prior to recycle within the facility or discharge to the environment. These wastes would be sampled continuously for radioactivity and effluents would be automatically diverted to the effluent retention tank if contamination is detected.

The candidate site for the ceramic immobilization facility is not located in an area historically prone to flooding, but is within the flood zone which could occur as a result of the failure of the MacKay Dam during a maximum probable flood. This flood event would be more critical than either the 100- or 500-year flood. Because INEL is in a region where flash floods could occur, the facilities would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater from the Snake River Plain Aquifer. As shown in Table 4.3.4.2.4-1, construction water requirements for the facility (38 million l/yr [10.0 million gal/yr]), would represent a 0.5-percent increase over the projected annual groundwater usage and would be within INEL's current allotment. As discussed in Section 3.4.4, a groundwater allotment not to exceed 43,000 million l/yr (11,360 million gal/yr) has been negotiated by DOE with the Idaho Department of Water Resources (DOE 1991c:4-73). No impacts to groundwater availability would occur. During operation, the water requirements for the facilities would be 250 million l/yr (66 million gal/yr). This would represent a 3.3-percent increase over the projected annual groundwater usage; INEL would still be well within the total groundwater allotment.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater and would not be expected to contribute to existing near surface contamination. Treated wastewater discharged to disposal ponds, however, could percolate downward toward the groundwater of the Snake River Plain Aquifer. This water would be monitored and would not be discharged to the disposal ponds until contaminant levels are within the limits specified. Impacts to groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combine effects of a deep water table, low discharge volumes, and high evaporation rates.

Pantex Plant

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for construction and operation of the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary wastewater (28.8 million l/yr [7.6 million gal/yr]) would be generated and discharged to the existing wastewater treatment systems north of Zone 12. During operation, a maximum of approximately 98 million l/yr (25.9 million gal/yr) of sanitary wastewater and other wastewater would be discharged to these wastewater treatment systems. After treatment, all wastewater generated during construction and operation would be discharged to the playa lakes or would be recycled. Since Pantex discharged approximately 1.4 million l/day (0.37 million gal/day) of wastewater into the

playas in 1994 and since this quantity is expected to decrease in the future, the expected quantity of additional wastewater potentially discharged to the playas should not cause any exceedance of the monthly average limit of 2.46 million l/day (0.65 million gal/day).

All chemical and industrial liquid nonradioactive waste streams (for example, system condensate, fire sprinkler water, cooling system blowdown) would be monitored, collected, and treated if necessary prior to recycle within the facility or discharge to the playas. These wastes would be sampled continuously for radioactivity and effluents would be automatically diverted to the effluent retention tank if contamination is detected.

The proposed location for the ceramic immobilization facility is in Zone 4. Since no 100-year, 500-year, or standard project flood boundaries have been delineated in Zone 4, there would be no impacts to floodplains. However, flooding in other areas of Pantex could occur due to the runoff associated with precipitation and ponding in local playas (LLNL 1988a:XVI).

Groundwater. All water required for construction and operation would be supplied from groundwater using the existing supply system which obtains water from the Ogallala Aquifer or possibly from reclaimed wastewater. Construction water requirements for the ceramic immobilization facilities would be small relative to the recoverable water in aquifer storage, which for the year 2010 was estimated to be 287 trillion l (75.8 trillion gal) (PX WDB 1993a:1). As shown in Table 4.3.4.2.4-1, construction of the proposed consolidated facilities would require 38 million l/yr (10 million gal/yr) of water, which would represent approximately a 15.3-percent increase over the projected annual No Action groundwater usage and 2-percent of the capacity of the groundwater wells. [Text deleted.] Previous studies have shown that when the Amarillo City Well Field pumped 18.5 billion l/yr (4.9 billion gal/yr) from the Ogallala Aquifer, an average of 1.8 m/yr (5.9 ft/yr) decline in the water table occurred over a 10-year period in the local well field area. This water level decline caused a shift in the groundwater flow direction beneath Pantex. Operating the ceramic immobilization facilities at Pantex would require 250 million l/yr (66 million gal/yr) resulting in a small drawdown representing 13.2 percent of the capacity of the groundwater system. This additional drawdown would not impact regional groundwater levels. The total site groundwater withdrawal including this facility would be 449 million l/yr (131.8 million gal/yr) which, because of expected cutbacks in other programs, would be 40 percent less than the 836 million l/yr (221 million gal/yr) currently being withdrawn from wells at Pantex.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater discharged to playas, however, could percolate downward into the groundwater of the near surface aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified by the TNRCC. [Text deleted.]

Although the expected drawdowns caused by withdrawing the water required for this alternative are small, the overall decline in groundwater levels in the Amarillo area is of concern. Possible groundwater conservation measures at Pantex that could be considered includes decreasing research farm irrigation demands through dry farming, installing dripless faucets, and process water reuse. In addition, to alleviate some of the effects from pumping groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex from the Hollywood Road Wastewater Treatment Plant for industrial use. However, details of this measure have not been determined.

Oak Ridge Reservation

Surface Water. Water required for construction and operation of the ceramic immobilization facility would be obtained from the Clinch River and its tributaries. [Text deleted.] During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr), which would represent a 0.3-percent increase over the projected annual No Action surface water withdrawal. During operation, water requirements would be approximately 250 million l/yr (66 million gal/yr). This would represent a 1.7-percent increase over the projected annual No Action surface water withdrawal. Total ORR withdrawals would be 0.4-percent of the

average flow of the Clinch River ($132 \text{ m}^3/\text{s}$ [$4,647 \text{ ft}^3/\text{s}$]). Minimal impacts to surface water availability would occur.

During construction of the ceramic immobilization facility, sanitary wastewater (28.8 million l/yr [7.6 million gal/yr]) would be generated, treated, and discharged to East Fork Poplar Creek. During operation, a total of 98 million l/yr (25.9 million gal/yr) of wastewater would be generated by the facility. This quantity would represent about 0.2-percent of the minimum flow of East Fork Poplar Creek and a 4.3-percent increase in annual discharge amounts. All discharges would be monitored to comply with discharge requirements. No impacts are expected.

All chemical and industrial liquid nonradioactive waste streams (for example, system condensate, fire sprinkler water, etc.) would be monitored, collected, and treated if necessary prior to recycle within the facility or discharged to natural drainage channels. These wastes would be sampled continuously for radioactivity and effluents would be automatically diverted to the effluent retention tank if contamination is detected.

The potential site location of the ceramic immobilization facility is located outside the 100-year floodplain; there would be no impact to the floodplain. The 500-year floodplain has not been determined in this area but could be developed in future studies.

Groundwater. No groundwater would be used for any project-related water requirements and no wastewater would be discharged directly to groundwater; therefore, neither groundwater quality nor availability would be affected.

Savannah River Site

Surface Water. No surface water withdrawals would be made; groundwater would be used for all construction and operation needs of a new ceramic immobilization facility. During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (28.8 million l/yr [7.6 million gal/yr]) would be generated and discharged to the sitewide wastewater treatment system, which would not require any modifications. This would represent a 4.1-percent increase in the effluent from this facility. If existing facilities were used, there would be less water used and wastewater discharged during construction. During operation, approximately 98 million l/yr (25.9 million gal/yr) of sanitary wastewater would be discharged to this wastewater treatment system. This would represent a 14.0-percent increase in the effluent discharged to Fourmile Branch from this facility. This discharge would not exceed 1.9 percent of the minimum flow of this stream; no impacts are expected. All discharges would be monitored to comply with discharge requirements. Other nonhazardous wastewater effluents (for example, condensation from air conditioning and heating, fire sprinkler water, cooling system blowdown) would be collected, monitored, and treated if necessary prior to recycle within the facility or discharge to the environment. These wastes would be sampled continuously for radioactivity and effluents would be automatically diverted to the effluent retention tank if contamination is detected.

The potential location for a new ceramic immobilization facility is outside the 100-year floodplain. Although, information on the location of the 500-year floodplain at SRS is currently available only for a limited number of specific project areas, the ceramic immobilization facility at SRS would not likely affect, or be affected by the 500-year floodplain of either the Fourmile Branch or Upper Three Runs Creek. This is because the facility would be located at an elevation of about 91 m (300 ft) above MSL and is approximately 33 m (107 ft) and 64 m (210 ft) above these streams and at distances from these streams of 0.8 km (0.5 mi) to 1.5 km (0.94 mi), respectively. The maximum flow that has occurred on the Upper Three Runs Creek was in 1990, with a flow rate of about $58 \text{ m}^3/\text{s}$ ($2,040 \text{ ft}^3/\text{s}$). At that time the creek reached an elevation of almost 30 m (98 ft) above MSL (SR USGS 1996a:1). The elevations of the buildings in F-Area are more than 63 m (202 ft) above the highest flow elevation of the Upper Three Runs Creek. The maximum flow that has occurred on the Fourmile Branch was in 1991 with a rate of approximately $5 \text{ m}^3/\text{s}$ ($186 \text{ ft}^3/\text{s}$), and an elevation of about 61 m (199 ft) above MSL.

(SR USGS 1996a:1). Elevations of the buildings in F-Area would be more than approximately 31 m (101 ft) higher than the maximum flow level that has occurred.

Groundwater. During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr), which would represent a 0.3-percent increase over the projected annual No Action groundwater withdrawal. This additional withdrawal should cause negligible impacts to groundwater availability. During operation, water used for cooling system makeup would be obtained from existing supply systems in the F-Area. The water for these systems is groundwater from the Cretaceous Aquifer. Water requirements during operations (250 million l/yr [66 million gal/yr]), as shown in Table 4.3.4.2.4-1, represent a 1.9-percent increase in the projected No Action groundwater usage at SRS. There would be reduced impacts if existing facilities are used. These additional withdrawals would not impact regional groundwater levels. Previous studies using numerical simulations of groundwater withdrawals from the Cretaceous Aquifer of eight times greater than that required for the ceramic immobilization facility indicate that drawdown could be almost 2.1 m/yr (6.9 ft/yr) at the well head, but would be smaller in overlying aquifers and would not extend beyond SRS boundaries in any aquifer (DOE 1991c:5-196). Therefore, it is expected that the withdrawals attributed to the ceramic immobilization facility would cause a small drawdown at the well head and should not affect any aquifers in the area.

No wastewater would be discharged directly to groundwater; therefore, groundwater quality would not be affected.

[Text deleted.]